WHAT IS CLAIMED IS:

1. A homogenous cation exchange membrane prepared using a method comprising:

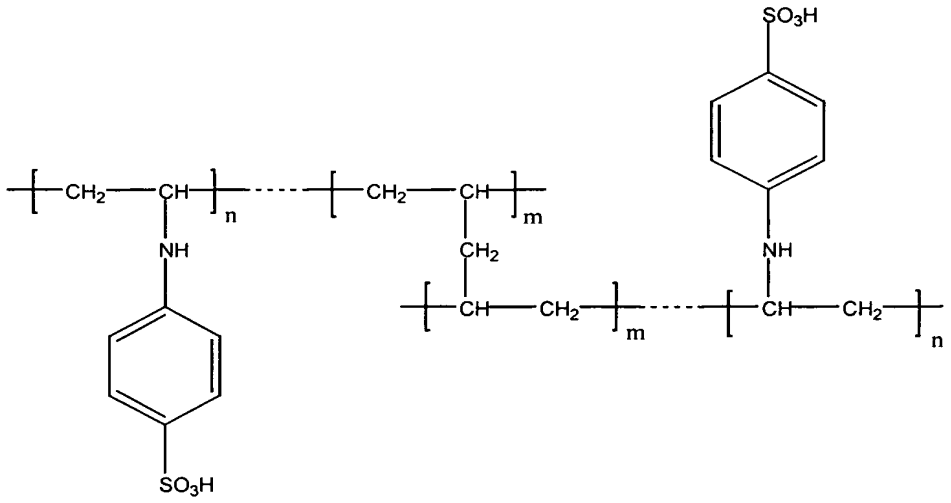
brominating a polyvinyl alcohol;

treating the polyvinyl alcohol with an acid to induce sulfonic acid groups;

forming a membrane; and

crosslinking the membrane using a formaldehyde solution to create a homogenous cation exchange membrane.

2. The membrane of Claim 1, wherein the membrane comprises a compound having the following formula:



3. The membrane of Claim 1, further comprising brominating the polyvinyl alcohol in a brominating mixture including 0.5N bromine in acetic acid.

4. The membrane of Claim 1, wherein the acid comprises sulfanylic acid.

5. The process of Claim 4 wherein the sulfanylic acid further comprises a 25% solution of sulfanylic acid.

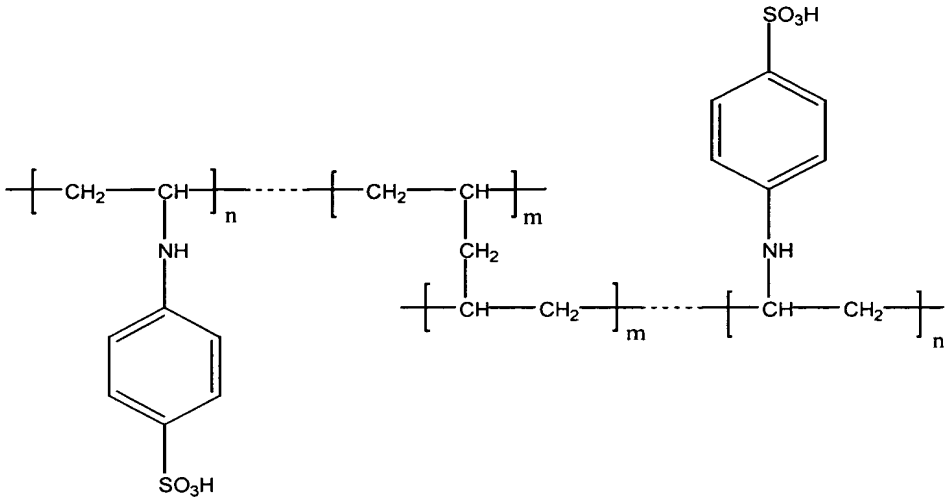
6. The process of Claim 1, wherein crosslinking further comprises treating the membrane with formaldehyde in concentrated sulfuric acid.

7. The membrane of Claim 1, wherein the membrane has an ion exchange capacity of 2 to 2.5 meq of sodium/g.

8. The membrane of Claim 1, wherein the membrane swells between about 25 to 30% in water.

9. The membrane of Claim 1, wherein the membrane has a resistance of approximately 3 to 4 ohm cm^2.

10. A cation exchange membrane comprising a compound having a formula of:



wherein the membrane is homogenous.

11. The membrane of Claim 10, wherein the membrane has an ion exchange capacity of 2 to 2.5 meq of sodium/g.

12. The membrane of Claim 10, wherein the membrane swells between about 25 to 30% in water.

13. The membrane of Claim 10, wherein the membrane has a resistance of approximately 3 to 4 ohm cm^2.

14. A process for electrodialysis comprising:

passing a solution comprising ions to be removed through a membrane stack having at least one cation exchange membrane prepared using a method including:

brominating a polyvinyl alcohol;

treating the polyvinyl alcohol with an acid to induce sulfonic acid groups;

forming a membrane; and

crosslinking the membrane using a formaldehyde solution to from a homogenous cation exchange membrane;

applying a current orthogonal to membrane surfaces while passing the solution through the membrane stack; and

withdrawing purified or concentrated solution from alternating compartments of the membrane stack.

15. The process of Claim 14 wherein the solution comprises an aqueous industrial effluent.

16. The process of Claim 14 wherein the solution comprises a naturally occurring aqueous solution.

17. The process of Claim 14, wherein the solution comprises brackish water or seawater.

18. The process of Claim 14, wherein the brackish water or seawater is not treated to remove excess ions prior to electrodialysis.

19. The process of Claim 1 4, wherein the cation exchange membrane is homogenous.

20. The process of Claim 14, wherein the cation exchange membrane further comprises a compound having the following formula: